Date: October 25, 1983

Subject: Primary Metals R & D Monthly Report
October, 1983

From/Location: E. L. Cambridge/TRL

To/Location: J. G. Kaufman/AHR

PRIMARY ALUMINUM

MLI Technology Implementation

An agenda for the meetings in Japan has been agreed upon and all other arrangements made. A list of key questions has been telexed to Mitsubishi as a basis for the technical exchange.

Paul Beckstrom from Columbia Falls spent two days in Tucson, assisting with preparation of the list of questions and discussing carbon testing in general.

Sebree Anode Formulation Optimization

An updated project plan was issued. The vibrated bulk density optimization phase has been completed. It was found that the optimum VBD granulometry was very close of Sebree's current screen curve. We are now beginning the pitch optimization part of the project. The next three to four weeks will be spent standardizing procedures and checking the reproducibility of the laboratory anode production process. The project is about one week behind plan.

Anode Consumption Cell

Three consumptions runs were completed. Dusting of the cell is still occurring with laboratory-produced, Soderberg anodes causing the generation of erroneously low consumption numbers. All three runs were operated without a nitrogen purge blanketing the cell in an attempt to air burn the dust that was formed.

A run is scheduled this week with prebake anode cores to reconfirm earlier results with the prebake cores and to determine if the dusting is the major contributing factor to the erroneous data and not equipment malfunction or procedural error.

Bauxite Evaluation

The second sample of bauxite from Aughinish has been received as has the set of Alcan procedures for the analyses. It is estimated that about 1 man month of technician time will be required to set up and test the procedures and complete the analysis of the first two samples. At present, no one is available to do this work and based on current activities, it will probably be the first of the year before manpower is available.

NEW PRODUCTS/PROCESS OPPORTUNITIES

AD-123

Using no "makeup" HCl, a run was made on the semi-pilot scale using stoichiometric amounts of ATH and aqueous HCl. Objectives were: (a) to

observe the change in reaction rate as the acid concentration became progressively lower by monitoring the percent HCl-temperature-time relationship, and (b) production of an ACH-HCl solution for use in silica removal tests via centrifuge methods. Confirming previous laboratory tests, this semi-pilot run showed that essentially, a complete stoichiometric reaction occurs under these conditions. Some water addition is necessary following reaction to adjust solution weights for complete ACH solubility. This approach appears to be a likely candidate for future SPA production since it allows for ridding the system of unreacted SiO_2 by mechanical means. To evaluate the effectiveness of commercial continuous centrifuges, tests have been scheduled at the Dorr-Oliver Corporation in early November.

Current plans for AD-123 project work include (a) decomposition of semi-pilot ACH batches using the "Boulder City" Bartlett-Snow kiln (now being installed), and (b) evaluation of each batch following decomposition with respect to chemical, physical and crystallographic properties. A 20 cubic foot Harrop gas fired shuttle kiln has been ordered with delivery expected in November and a pilot-scale ball mill will be ordered within the next few days. Delivery time for the mill should coincide with the kiln delivery. Calcination and milling studies, as well as subsequent testing of physical and ceramic properties, will be expedited as soon as this equipment is available.

Based on test results available to date, flowsheets for SPA, HPA and LSA alumina production have been re-designed. Product cost studies using the current flowsheet concepts are now being conducted. A complete report detailing results of this work, as well as recent results of laboratory and semi-pilot scale tests, will be written within the next month.

Jerry Davis attended the West Coast/Electronics divisional meeting of the American Ceramic Society the week of October 1 through October 5, 1983. Several papers were attended which were relevant to our current efforts in high purity aluminas and ceramics. Contacts were made with representatives of Coors Porcelain Company, Kyocera, Union Carbide, 3M, Bournes and Tektronix. All expressed considerable interest in ARCO's plans with respect to development and marketing new ceramic-grade aluminas.

AD-120 Bleed Stream Pilot Plant

A series of breaks in major glass components caused delays in start up. These have been repaired and spare glass tops for the 12- and 18-inch crystallizers have been ordered. As of October 17, all units were sufficiently leak free to operate, instrumentation was operating, and filling with liquors had begun. The instrument air supply has not been reliable. A back up has been installed so that failure of the house system does not require a shutdown. The plant is now operating under test conditions.

A draft of the report on operating procedures is being reviewed.

AD-120 Alternate Bleed Stream Tailings Treatment

Reaction of the model bleed stream waste salt solution with silica residues from clay leaching shows promise as a means of recovering chloride values

and producing a solid residue with a reduced level of soluble metal salts. Chloride recovery at 600°C was >98 percent and at 1000°C it was >99 percent. The only element that appears to leach from the final residue is calcium. Further work will be carried out to test temperature effects, immobilization of calcium, steam requirement and to make a cost estimate on the method.

AD-120 - Costs

A proposal has been received from Ruthner on the cost of ACH decomposition and HCl recovery for the 2400 tpd clay plant. They propose a single-stage, indirectly heated rotary kiln system. Installed cost is $115M, compared to our Q1, 1983 estimate of $120M.

AD-120 - Chlorination

A study to determine the effect of various coke pretreatments and different types of coke on total chlorinated hydrocarbon formation in $AlCl_3$ from reductive chlorination of PCACH was completed. Results from both batch reactor and initial continuous reactor tests indicate it is possible to produce $AlCl_3$ with <60 ppm total CxCly containing <10 ppm PCBs, if the coke reductant is steam calcined at 950°C for 30 minutes.

AD-124

Assembly of the 2 ka cell remains essentially on schedule with start-up projected by Thanksgiving. Delivery of the cathode blocks from Union Carbide may, however, cause some delay.

A first approximation model for alumina solubility, liquidus temperature and conductivity as a function of electrolyte composition has been developed. An electrolyte with a ratio of 1.46-1.78 and 30%-20% LiF has a liquidus of approximately 800°C and an electrical conductivity which is a factor of 2 greater than a conventional electrolyte. These properties are necessary to project a cell power consumption of $\simeq$5 kwh/lb. This electrolyte has performed very well in a 100 amp cell, with little carbon dusting observed. Although difficult to quantify in a cell of this type, the tendency to sludge appears to be reduced.

R & D FACILITIES

- An AFC for the purchase of $13.7M additional carbon screening equipment was submitted for approval.

R & D STAFF

Reports and Publications

The following report was issued:

83-TP-5 "Columbia Falls Anode Formulation Optimization - Phase II" by K. R. Weisbrod and I. Vogelmann.

In addition, the following two papers were approved and submitted to AIME for presentation at the 1984 Annual Meeting and publication in "Light Metals - 1984".

"The Ammonoalunite Process for Production of Alumina from Clay" by R. W. Bartlett, R. J. Wesely and T. R. Bolles.

"Anode Consumption Test Cell" by K. R. Weisbrod and P. P. Russell.

Training

D. S. Moran and J. B. Snodgrass attended a 1-week PROJECT/2 training seminar in San Francisco.

G. J. Kujawa, D. S. Moran, R. D. Thigpen, R. F. Bell, K. R. Weisbrod and S. Young attended the American Chemical Society Technical Writing Course given in-house, 20 & 21 October.

Headcount

As of October 31, head count will be:

Exempt	15	Minority	3 (1 Amer.Indian, 2 female)
Non-Exempt	10	Minority	4 (2 Hispanic, 2 female)
Totals	25		7

Fifteen temporary employees are currently on-site, primarily to support the Bleed Stream Pilot and AD-125 batch operations.

Effective 31 October 1983, G. J. (Gerry) Kujawa will transfer to us from Anaconda Minerals, as a senior research engineer in the Chemical Products group reporting to Jerry Davis.

There are two offers outstanding for senior research engineer positions in Metals Extraction and Ore Processing.

Ted

E. L. CAMBRIDGE

ELC:pm

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